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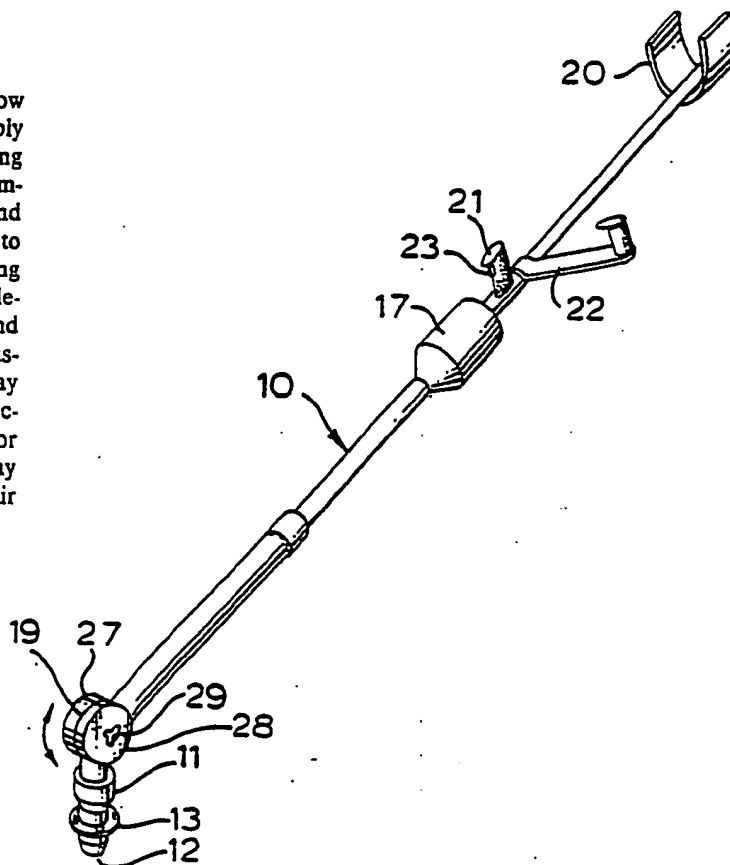
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(54) Title: PLANT-KILLING DEVICE

(57) Abstract

A weed-killing device has an elongate hollow handle (10) having a hollow body (11) adjustably mounted on one end, the body having electric heating elements therewithin and an outlet nozzle (12). A chamber (17) is provided part-way along the handle (10) and an electric motor driven fan unit (16) is arranged to draw air into the chamber (17) and drive the air along the handle, through coupling (19), over the heating elements and out of the nozzle (12). Hand grips (21 and 22) are provided for ease of use. An internal combustion engine driving a fan and an electric generator may be provided within the chamber (17) instead of the electric motor driven fan unit, waste heat from the motor then serving to pre-heat the air. Different nozzles may be provided to allow destruction of weeds by the hot air blast, without harming immediately adjacent plants.



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PLANT-KILLING DEVICE

5 This invention relates to a hand-held plant-killing device which is suitable for use in horticulture, and relates particularly - but not exclusively - to a device suitable for use in a domestic garden to aid the destruction of unwanted plants such as weeds.

10 One of the problems encountered in both domestic and commercial gardening is that of ensuring that the chosen plants thrive whilst any that are unwanted, hereinafter generally referred to as weeds, are at least controlled, but preferably eliminated. Traditional methods of weed removal such as hoeing are laborious and time-consuming, whilst the use of herbicides may not be sufficiently selective, and in
15 any case may be considered unacceptable because of possible detrimental effects on the wider environment. Another method for killing the weeds is to burn them with blowlamp-like equipment, but this may be inconvenient for domestic use due to the skill required
20 to start and maintain the flame, and there is a risk of accidental damage to neighbouring plants and of causing fires.

The present invention seeks to provide a relatively clean and controllable device to kill weeds
25 - and maybe also seeds. More specifically, it proposes

a hand-held plant-killing device comprising a manually grippable elongate handle supporting at or adjacent one end thereof a hollow body having at least one air inlet aperture and at least one air outlet nozzle, an electric heating element being located within the body and having means for connection to an electric power source, and a motor-driven fan directly or indirectly mounted on the handle and arranged to cause air to flow through the body from the or each inlet aperture over the heating element and out of the or each outlet nozzle, for direction at a plant to be killed.

The handle may be an aluminium rod or tube one end of which is suitably adapted for connection to the body. Whilst this connection may be rigid, it is preferred that there be permitted at least some adjustment, so that the best position of the body relative to the handle for ease of use may be selected at any particular time. The handle and body may, for example, be arranged to co-operate through a hinging joint.

The handle may be of a fixed length, but more conveniently it comprises two telescopically-slidable sections which may be releasably locked together once extended to the preferred length for any given user or job.

In order to assist the user's grasp and manipulation of the handle there may be provided

thereon at least one projecting grip, such as a short plastics- or rubber-covered metal rod mounted substantially normally to the handle. In a preferred embodiment of the invention there are two grips, one
5 for each hand of the user, one of which is releasably rotatable about the handle to permit right- or left-handed operation of the plant-killing device. The device may in addition incorporate at or adjacent the other end of the handle to that supporting the body an
10 arm clip into which the user may place one of his arms. This may be particularly useful for elderly or infirm people.

The body may be generally tubular, with one open end thereof constituting the air inlet aperture and the
15 other forming, or adapted to receive, the outlet nozzle. Mounted within the body is the heating element, conveniently of between 1 and 3kW, depending upon the anticipated workload. It may be advantageous for there to be a control permitting adjustment by the
20 user of the heat output of the heating element.

The motor-driven fan may also be located within the body and so mounted indirectly on the handle. In a preferred embodiment of the invention, the handle is tubular and has one end connected to the body in
25 register with the air inlet aperture, the motor-driven fan being mounted on the handle adjacent the other end thereof, and so close to the point at which the user

grips the handle whereby the fan directs air through the handle to the inlet aperture. Such an arrangement has the advantage that the effective weight of the device experienced by the user is reduced. It is particularly preferred in this case that there be provided within the handle a chamber to house the motor-driven fan, the chamber having at least one air inlet aperture. The fan and its motor could be separate, rather than provided as a unit, in which case the motor may be located within a chamber on the handle, the fan then being located within the body and being driven by the motor for instance by means of a flexible drive wire extending along and within the handle.

15 A control, operable by a user, may be provided for the motor to permit the user to select a suitable air delivery volume having regard to the kind of plants to be killed.

The plant-killing device may be arranged for connection to the domestic electricity mains supply, the fan motor then being a mains-operated electric motor, or, to give complete freedom of movement, the device may be provided with an internal combustion engine which drives an electric generator to provide the necessary electric power supply to the heating element. In this latter case, the fan may be driven either by the engine directly, or by an electric motor

powered by the generator.

In the case where an internal combustion engine is used to drive a generator which powers the heating element, the amount of heat which is to be imparted to the air by means of the electrical heating element may be minimised by pre-heating the air with waste thermal energy produced by the engine. To this end, it is preferred for there to be air guide means defining an air flow path within which the motor is at least partially located, the fan being arranged to cause air to flow through the air guide means and so over at least some of the surfaces of the engine before entering the hollow body.

The pre-heating effect may further be enhanced by utilising at least some of the heat of the exhaust gases: though it would be possible for the engine to discharge its exhaust gases directly into the guide means for mixing with the air drawn over the engine surfaces, this is not a preferred approach, in view of the impure nature of the exhaust gases. Instead, a heat exchanger may be disposed within the guide means through which heat exchanger the exhaust gases are passed, to transfer heat to the air drawn over the engine.

To help prevent accidental damage to plants growing near to those to be killed, there may be provided a shield for fitting around or adjacent the

nozzle of the device to restrict the area to which the emitted heated air is applied. The shield may take the form of a metal plate which is generally cylindrical but which has a section removed therefrom to allow viewing of the nozzle; alternatively it may comprise a collar mountable over the nozzle which collar carries two parallel metal plates to provide protection for adjacent plants when the area being worked upon consists of a series of closely-planted rows. It is preferred that the shield be detachably mounted, and also capable of tilting relative to the nozzle, further to facilitate the selective treatment of plants.

Two preferred embodiments of the invention will now be described, though by way of illustration only, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a first embodiment of weed-killing device of the invention;

Figures 2 and 3 are diagrammatic sectional views of parts of the device of Figure 1;

Figure 4 is a perspective view of a shield suitable for use with the device of Figures 1 to 3;

Figure 5 is a diagrammatic sectional view of the shield of Figure 4 in use, showing the possible tilting movement thereof;

Figure 6 is a perspective view of an alternative shield for use with the device of Figures 1 to 3; and

Figure 7 is a cross-sectional view through a part

of an internal combustion engine driven weed-killing device.

Figures 1 to 3 show a weed-killing device having an adjustable-length telescopic tubular handle 10 at one end of which is located a generally tubular metal body 11 (not shown in Figure 3) having an external layer of a thermally-insulating material (not shown). The body has a detachable friction-fit air outlet nozzle 12. An external flange 13 is provided on the nozzle, by means of which the shield of Figure 4 may if required be mounted on the body 11, as described below. An electric heater having two separate heating elements 14 and 15 (shown in Figure 2 only) is mounted within the body 11 for heating air passing through the body for emission from the nozzle. Air is supplied to the body by an electric-motor-driven fan unit 16 (see Figure 3) which is housed in a chamber 17 provided within the handle 10, at approximately the mid-point thereof. Apertures 18 are provided for entry of air into the chamber 17, the fan driving the air along the handle 10 to a coupling 19 connected to an inlet of the body 11, over the heating elements 14 and 15 and out of the nozzle 12.

In order to facilitate the handling of the device, particularly by elderly people, there is provided an arm clip or restraint 20 at the other end of the handle to that supporting the body, which clip is used in

conjunction with two projecting grips 21 and 22 mounted one above the other on the handle near the chamber 17 and approximately an arm's length from the clip. A switch 23 for actuating both the fan unit and the heater of the device is mounted on grip 21. The grip 22 can be rotated about the handle to any desired position and then locked in place. The user can manipulate the device single-handedly by placing one arm through the clip 20 and grasping with one hand the fixed grip 21 to support and operate the device, though he may in addition hold the suitably-adjusted second grip 22 with his other hand to help manoeuvre the device as desired around a garden.

Referring to Figure 2, it can be seen that the body 11 has an air inlet aperture 25 at one end thereof, connected to the interior of one half of the coupling 19. This coupling has two similar drum-shaped halves 26 and 27 held together by means of a bolt 28 and wing nut 29, the lower end of the handle being connected to the interior of the other coupling half 27. In this way, the angle between the axes of the handle 10 and the body 11 may be adjusted and then locked as required, using nut 29.

The body has a cable entry gland 30 for a flexible wire 31 supplying power to the elements 14 and 15. One element may have a 1kW rating, and the other 2kW, whereby a user may select by means of a suitable switch

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(not shown) power settings of 1kW, 2kW or 3kW. The wire 31 is clipped at suitable intervals to the handle 10 externally thereof, or may enter the handle above coupling 19 to pass internally along the handle, to the switch 23. A further long cable (not shown) extends from the grip 21 to a plug for insertion into a mains socket. In normal use, the body may lie at an angle of approximately 120° to the handle, but it may be desired to reduce this to about 90° if the tool is to be used from a sitting position, or on raised plant beds.

Figures 4 and 5 illustrate one embodiment of a shield suitable for use with the device of Figures 1 to 3. The shield comprises a curved plate 35 having at one end an internal lip 36 the internal diameter of which is slightly smaller than the external diameter of the flange 13 on the nozzle 12, whereby the shield may be mounted over and retained on the nozzle 12. A series of spaced notches 37 in the lip 36 co-operate with lugs on the nozzle flange 13 so that the shield may be mounted in the required rotational position and then in use remain generally in that position, whilst at the same time permitting tilting movement of the shield (as shown by the broken lines in Figure 5) to enable hot air from the nozzle 12 to be directed close to but not at plants which are not to be killed. A band 38 of a thermal insulation material extends around the shield to permit a user to hold and rotate or

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remove the shield when hot.

5 An alternative form of shield is shown in Figure 6. This shield comprises an annular metal collar 40 of a diameter suitable for friction mounting over the nozzle 12 below the flange 13. The collar 40 carries two parallel metal plates 41 and 42 which may be positioned between two adjacent rows of plants, thereby allowing any unwanted weeds growing between these rows to be killed without fear of damage to the
10 cultivated plants.

Referring now to Figure 7, there is shown a part of a second embodiment of weed-killing device of this invention, which utilises an internal combustion engine as the power source, rather than the electric mains
15 supply as in the first embodiment. The embodiment of Figure 7 largely corresponds to the first embodiment and differs principally only in that the electric motor fan unit 16 within the chamber 17 is replaced by an internal combustion engine fan unit 49, as shown in
20 Figure 7. Though the switch 23 must be replaced by suitable controls for the unit 49, in all other respects this second embodiment substantially corresponds to that described above, and will not be described again here.

25 The motor-driven fan unit 49 comprises an air-cooled internal combustion engine 50 drivingly connected to an electric pump 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

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mounted on the generator shaft remote from the engine. Cooling fins 53 are provided on the generator, to dissipate heat therefrom. The engine 50 and generator 51 are mounted on a support bracket 54 disposed within the chamber 15, but a fuel tank 55 for the engine 50 is mounted externally of that chamber 17 and is provided with a fuel line 56 leading to a carburettor 57 for the engine. The exhaust manifold 58 of the engine feeds the exhaust gases into an exhaust gas heat exchanger 59 also disposed within the chamber 17, an exhaust pipe 60 leading from the heat exchanger out of the chamber 17 to a silencer 61. Wires 62 are provided to connect the generator 51 to the electric heater elements 14 and 15, shown in Figure 2. A usual form of recoil pull cord mechanism (not shown) is provided for starting the engine.

In operation, it will be appreciated that the fan 52, when driven by the engine 50, draws air through apertures 18, over the generator 51, the engine 50 and exhaust gas heat exchanger 59, before being fed down the tubular handle 10 to the body 11. Within the body 11, the air is further heated by the energised electric heater elements 14 and 15, before being emitted through the nozzle 12.

By virtue of the pre-heating of the air by both the engine and the exhaust gas heat exchanger, the amount of heat which must be added

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the heating elements 14 and 15 is reduced, so requiring only a smaller generator 51; in turn, this means a lower-powered engine 50 may be employed with a consequent reduction in fuel consumption. This gives rise to a particularly efficient form of plant-killing device. Efficiency and operator comfort may further be improved by providing insulation material 63 on the outside of the tubular handle.

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wherein the motor-driven fan is located within the body.

7. A device according to any of claims 1 to 5, wherein the handle is tubular and has one end connected to the body in register with the body air inlet aperture, the motor-driven fan being mounted on the handle to direct air through the handle to the said inlet aperture.

8. A device according to any of the preceding claims, wherein an internal combustion engine is arranged to drive the fan and an electric generator to provide electric power for the heating element.

9. A device according to claim 8, wherein there is provided air guide means defining an air flow path within which the motor is at least partially located, the fan being arranged to cause air to flow through the air guide means and so over at least some of the surfaces of the engine before entering the hollow body.

10. A device according to any of the preceding claims, wherein a shield is provided for fitting around or adjacent the nozzle of the device to restrict the area to which the emitted heated air is applied.

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wherein the motor-driven fan is located within the body.

7. A device according to any of claims 1 to 5, wherein the handle is tubular and has one end connected to the body in register with the body air inlet aperture, the motor-driven fan being mounted on the handle to direct air through the handle to the said inlet aperture.

8. A device according to any of the preceding claims, wherein an internal combustion engine is arranged to drive the fan and an electric generator to provide electric power for the heating element.

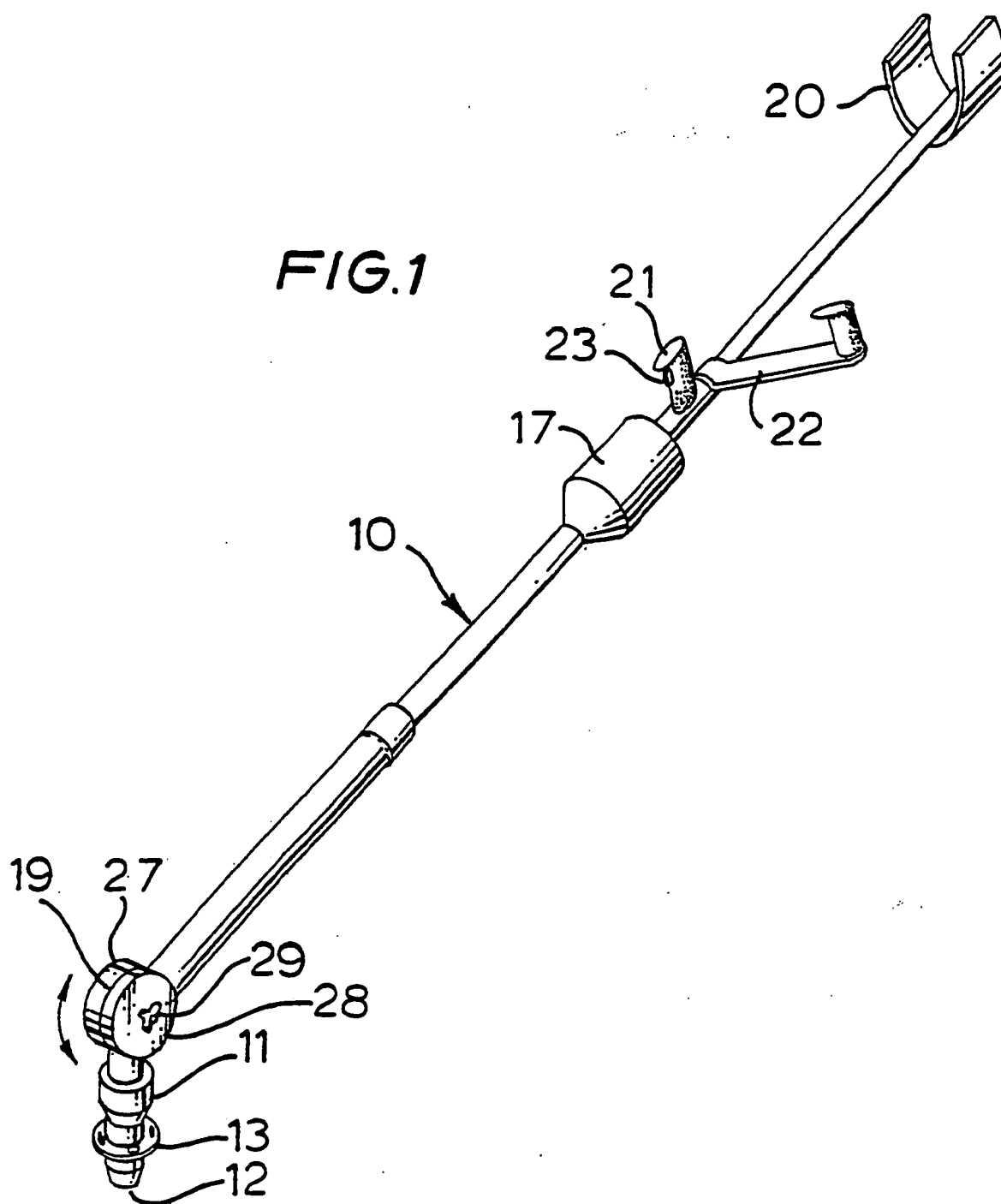
9. A device according to claim 8, wherein there is provided air guide means defining an air flow path within which the motor is at least partially located, the fan being arranged to cause air to flow through the air guide means and so over at least some of the surfaces of the engine before entering the hollow body.

10. A device according to any of the preceding claims, wherein a shield is provided for fitting around or adjacent the nozzle of the device to restrict the area to which the emitted heated air is applied.

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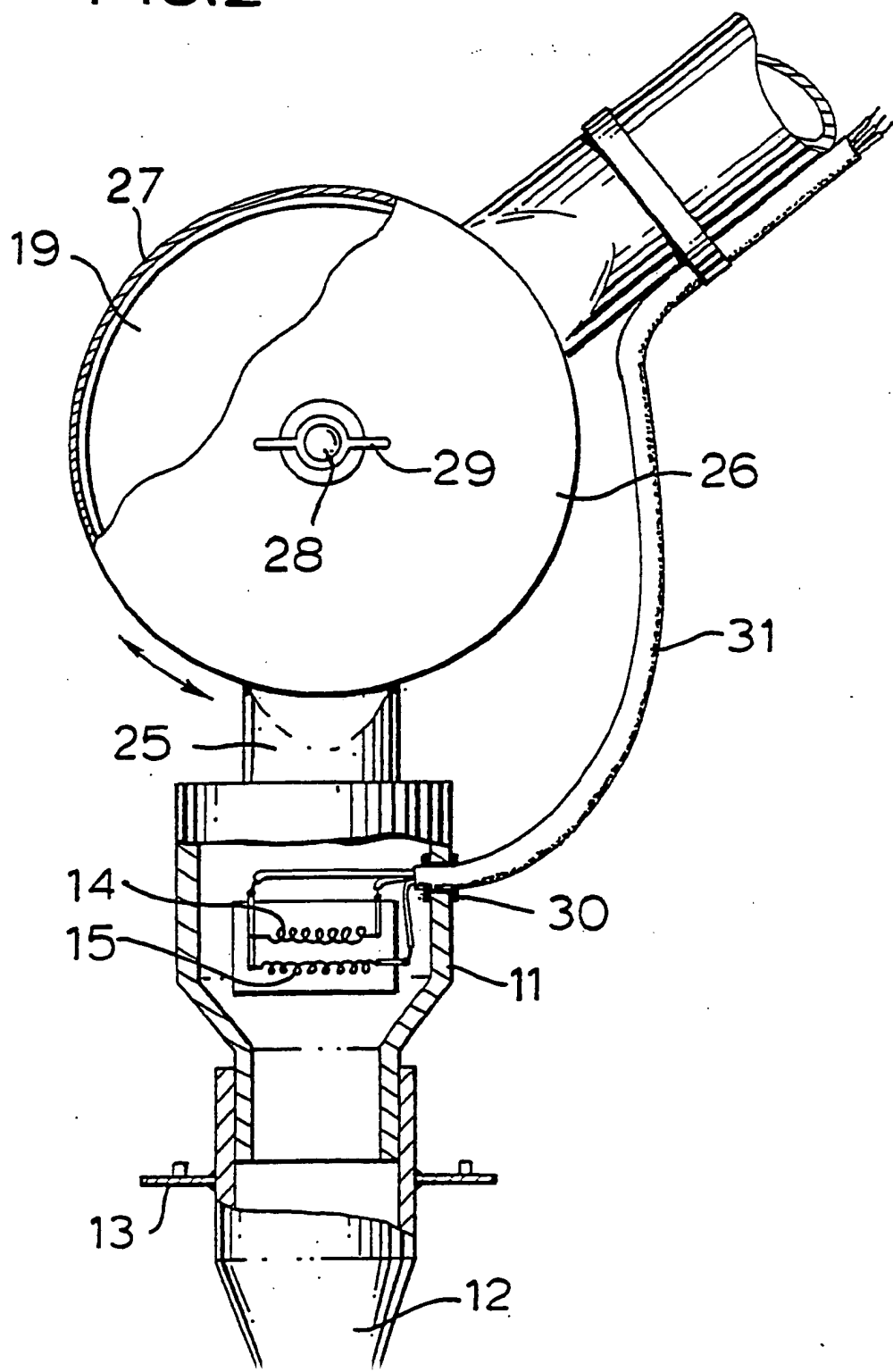
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FIG. 2

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FIG.3

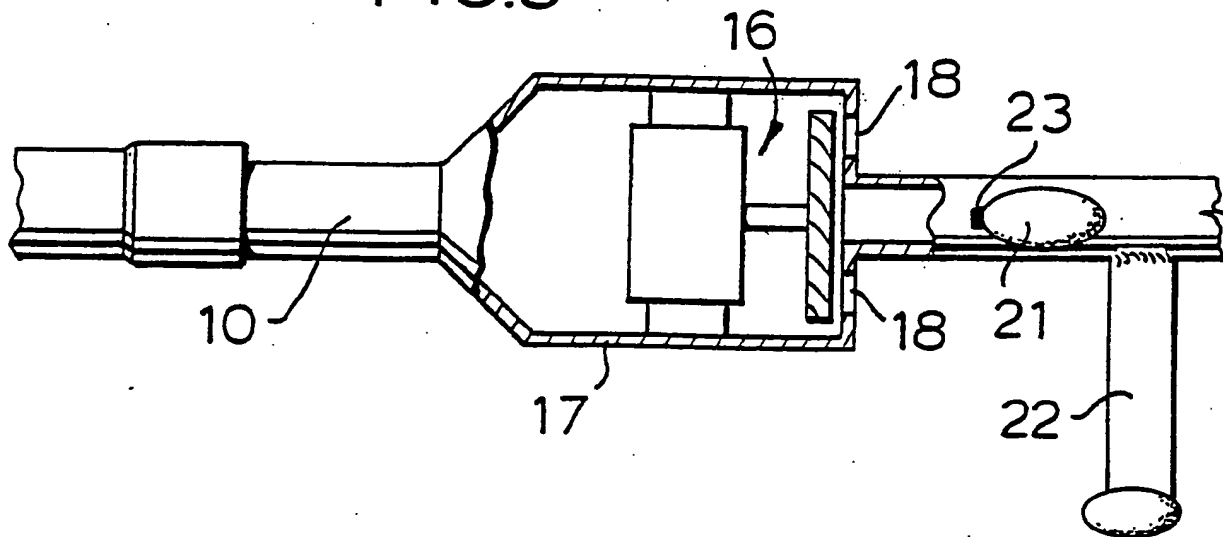
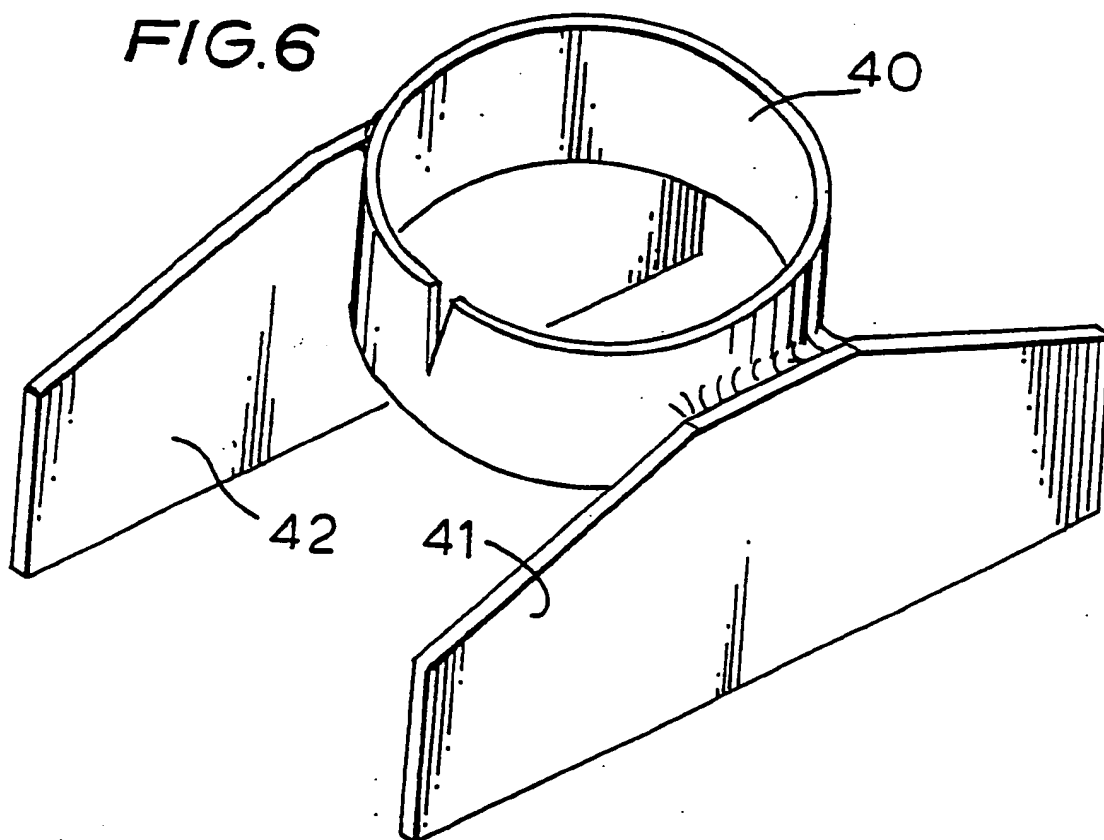


FIG.6



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FIG. 4

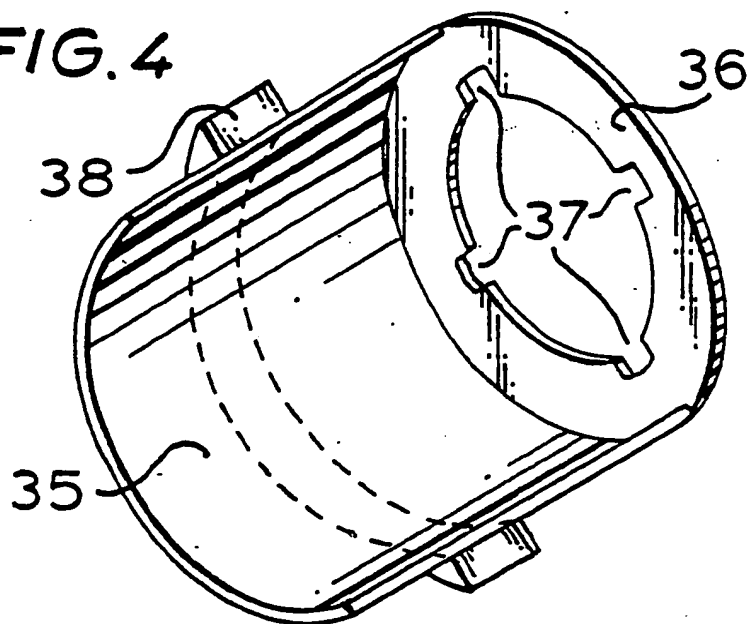
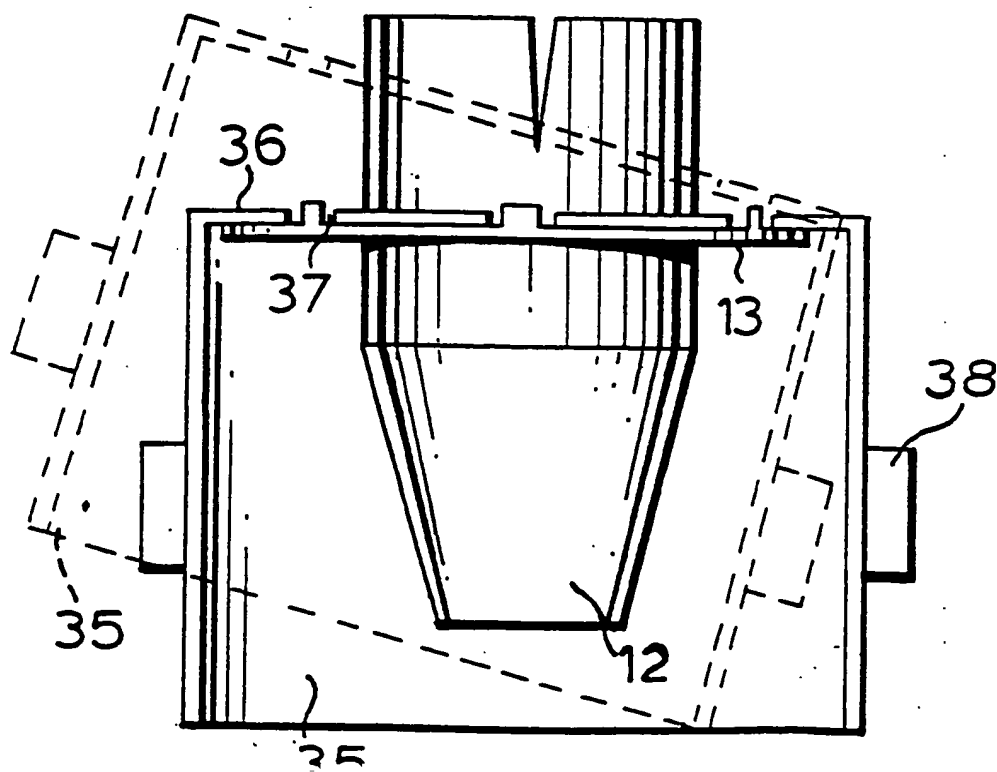


FIG. 5



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 91/00424

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A01M21/04

II. FIELDS SEARCHED

Minimum Documentation Searched⁷

Classification System

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A01M

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹

Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	US,A,2 548 196 (M.G.CLARK) April 10, 1951 see column 1, line 3 - column 2, line 41; figures 1-2	1
A	---	2-5,10
Y	DE,A,2 828 743 (H.W.WOLF) January 10, 1980 see page 2, paragraph 5 - page 3, paragraph 3	1
A	CH,A,663 319 (H.E.BRUNNER) December 15, 1987 see abstract; figure 1	1
A	GB,A,1 505 767 (H.J.PAINE) March 30, 1978 see page 1, line 29 - line 70; figure 4	1
A	US,A,3 945 370 (H.M.ESSINGTON) March 23, 1976 see abstract; figure 1	1
A	GB,A,2 122 511 (M.MAKAR) January 18, 1984	

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IV. CERTIFICATION

Date of the Actual Completion of the International Search

25 APRIL 1991

Date of Mailing of this International Search Report

30 MAY 1991

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

NEHRDICH H.J

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ON INTERNATIONAL PATENT APPLICATION NO.

GB 9100424

SA 45517

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DE-A-2828743	10-01-80	None	
CH-A-663319	15-12-87	None	
GB-A-1505767	30-03-78	None	
US-A-3945370	23-03-76	None	
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